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# Building Biodiversity

**BUILDING SEAWALLS TO SUSTAIN INTERTIDAL BIODIVERSITY IN ALTERED AND URBANIZED ESTUARIES**

**A Linkage Project  
funded by the  
Australian  
Research Council**

Centre for Research  
on Ecological  
Impacts of Coastal  
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University of Sydney

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Primary Industries  
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BIO-ANALYSIS:  
Marine, Estuarine &  
Freshwater Ecology

NSW Department of  
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Conservation

NSW Maritime

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Natural Resources

Sydney Ports  
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Mosman Municipal  
Council

North Sydney  
Council

Wyong Shire Council



Contact:

Prof. M.G. Chapman  
Centre for Research  
on Ecological Impacts  
of Coastal Cities

(02) 9351 4778

Email:

gee@eicc.bio.usyd.edu.au

## Intertidal rock-pools on McMahon's Point seawall

A very exciting project in this Linkage Grant involves our collaboration with North Sydney Council and their consulting engineers, Macleod Consultants. An extensive seawall at McMahon's Point is in disrepair and is being rebuilt as part of the Council's programme of repairing and redesigning many of their seawalls. The original seawall was made of sandstone blocks, but, in order to provide adequate support and resistance to wave-action in the long term, a precast concrete seawall is being constructed, founded on steel piles driven into rock. The concrete seawall is being faced with large sandstone blocks so that it will resemble the original wall and meet Council's standards for improved aesthetic value of these shores.



*Building the seawall at McMahon's Point*

The vertical sandstone face still lacks many of the natural features of seashores that support biodiversity on rocky shores. The most important of these habitats are shaded overhangs and pools or crevices that retain water during low tide. This is where the new seawall at McMahon's Point is leaping ahead in innovation. The new construction incorporates deep rock-pools, embedded into the sandstone facing at high, mid- and low tidal levels. These are designed to retain water during low tide. It is expected that they will add novel and important habitat to what is otherwise a typical seawall (vertical and rather featureless) and that this new habitat will enhance the numbers and types of animals and plants that can live on this constructed intertidal shore.

Our close collaboration with North Sydney Council, Macleod Consultants and John Nixon Engineering, who are overseeing the work, has ensured that the design of the construction meets the requirements of a rigorous ecological experiment. Pools have been added to 3 different sections of the wall, with intervening sections without pools, allowing an unconfounded test of the effects of pools on biodiversity in the pools themselves and on the surrounding rock wall. There are also 6 pools at each of 3 different tidal heights, interspersed throughout each section, to ensure adequate replication for powerful analyses and to test the effects of adding pools for 3 different intertidal assemblages, which are exposed to different amounts of emersion and environmental stress.



*A pool embedded into the face of the new seawall*

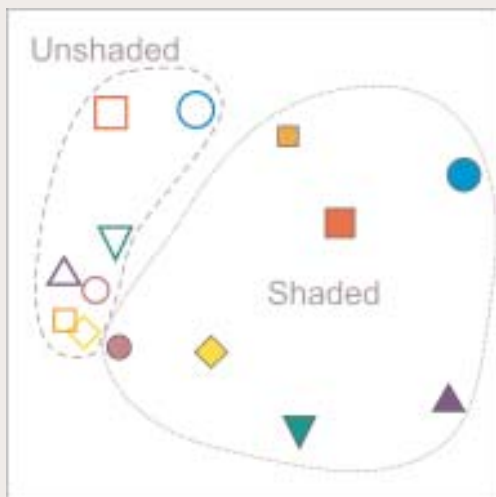
As part of the ARC Linkage Grant, we (at EICC) will be measuring changes to biodiversity within and around these pools over the next 3 years. This project is unique in its innovation and scope. Seawalls have not previously been enhanced with such numerous and extensive habitats. We expect the results of this study will be of interest worldwide to those who build or commission the construction of seawalls and who wish to enhance or maintain local levels of intertidal biodiversity.

**GEE CHAPMAN**

**PROFESSOR OF MARINE ECOLOGY AND DEPUTY DIRECTOR**

## Temperate Reef Symposium

The 7<sup>th</sup> International Temperate Reefs Symposium was held recently in Santa Barbara, USA. At the symposium, I presented a talk about some of the research done by the Centre on seawalls in Sydney Harbour. This presentation focused on the impacts of building wharves and of waves from boat-traffic in the Harbour on the animals and plants living on intertidal seawalls. Specifically, I discussed how shading by wharves can affect the assemblage of organisms on seawalls, resulting in the dominance of space by sessile animals and the almost complete lack of algae and grazing animals. I also showed how exposure to waves generated mostly by passing boats meant that assemblages differed greatly from those on nearby sheltered seawalls, with the assemblage closely resembling what would have been predicted from studies on wave-swept shores on the open coast.



*nMDS plot showing a graphical representation of assemblages of intertidal animals and plants on seawalls shaded by wharves (filled shapes) or unshaded (empty shapes). Different colours and shapes indicate assemblages from different locations within Sydney Harbour. Points close together represent similar assemblages*

This illustrates that it is not just the design of seawalls themselves that must be considered when assessing their impact on local biodiversity. Other features of the environment in the location in which they are built, such as proximity to boat-traffic must also be considered. It also shows how different types of artificially built structures can interact to affect marine biodiversity.

**DAVID BLOCKLEY**  
RESEARCH FELLOW

## A New Seawall at White Bay

Parts of the old vertical concrete seawall at White Bay have become unsafe and so are being demolished for a new seawall.



*Old seawall, to be demolished (photo courtesy of Sydney Ports Authority)*

Several different designs were put forward, most of which consisted of an inclined rubble-bank of some description. The design which has been built on this site is a stepped wall made of large rough-cut sandstone blocks. This stepped design means that the seawall has horizontal surfaces, approximately 0.5 m wide and vertical surfaces, approximately 0.3 m high, at various heights on the shore. The stepped sandstone wall represents a considerable change over the previous vertical concrete seawall. Being constructed from a natural material, it is similar to local natural rocky shores. The steps incorporate horizontal surfaces, which are a common feature of most rocky shores around Sydney, but are usually lacking on seawalls. This will increase the intertidal area as well as allowing for small rock-pools, which are another important feature of natural shores lacking on seawalls.



*New seawall at White Bay*

This design will allow us to compare differences between the types of organisms found on vertical versus horizontal surfaces, which can be used as part of our advice to those who design, build and repair seawalls.

**DAVID BLOCKLEY**  
RESEARCH FELLOW